

Aug 27th. 1923

Dear Jay:-

Have been away. Arrived home to your wire Saturday.
Answered by wire.

While I have not written the following, I delivered it in a lantern address at Columbus at last years meeting, and you are welcome to use all or any part of it.

Shows
It is of course entirely theory, based upon clinical observation, associated with newer physiology, and I believe it to be right as far as it goes.

He saw
Will present to you, in a hurry the brief facts so that I can get it off my chest. *Shows*

Lantern slide inclosed, showing "Metabolic rate in normal subjects from birth to age of eighty - estimated in calories produced per hour, per square meter of body surface. Shimer, our pathologist, and a good one, worked for days on this chart and after the meeting he found one which is practically the same thing already compiled. In as much as the two were so nearly alike, and compiled entirely separately, they are both probably close to being correct.

1. In anesthesia we desire to abolish, or sufficiently obtund reflex activity, that it will not interfere with the operation.
2. In all conditions practically, whether normal or abnormal, excepting only nervous and mental disease, METABOLIC RATE AND REFLEX IRRITABILITY RUN PARALLEL COURSES. CELL OXYGEN DEMAND AND METABOLIC RATE of course are one and the same thing.

Thus to analyse the chart of the normal subject.

Metabolism is low at birth (35 Cal. per Hr. per Sq. Meter body surface). Makes a very sharp rise in ^{the} first year to 45. Then ^{it} continues to rise more slowly to 5th or 6th yr when metabolic rate is at its highest point throughout life. Then sharp drop to 42 at "Pre-pubescent period" age 12 or 13. Then ^{the} pubescent development period shows a sharp rise to 46 at age of 14 or 15 which constitutes the next highest metabolic rate in normal life. Then ^{there is a} sharp drop, more progressive in nature, to about 40 at 20 or 21 yrs. which announces full and staple adult development from physiological standpoint. From here on to the age of eighty there is a progressive decline in metabolic rate to the age of 80 yrs, at which time the rate is practically the same as at birth.

~~Now---Clinical-observation-with-Gas-anesthesia-shows~~

NOW Reflex irritability in the normal subject runs a course exactly parallel to the above metabolic curve.

NOW AGAIN. Clinical observation in Gas anesthesia has shown us that in the average case, anesthesia is more difficult at the ages of higher metabolic rate, or to put it more completely, more difficult at ages of higher reflex irritability and metabolic rate. Question. WHY?.

the
ANSWER is something like this. Higher metabolic rate means HIGHER OXYGEN CONSUMPTION, hence - HIGHER CELL OXYGEN DEMAND. Assuming that a cell content of (Arbitrary figures only) 88% N2O is necessary in a given subject to produce quiet operative anesthesia, that will leave in the cell space for 12% oxygen. If 12% oxygen supplies the demand in that patient everything will be O.K.. If however, the patient be of an age of higher metabolic rate, or there is some other condition leading to a higher metabolic rate, there will be a proportionate increase in the cell oxygen demand. Asphyxial anesthesia even to a slight degree cannot be as quiet as non asphyxial, and THE OXYGEN DEMAND MUST BE SATISFIED. Let us say that in this case, where 88% gas is necessary, that the oxygen demand has been raised to 15%. That cuts down the possible dose of N2O in the mixture delivered to 85%, and even though the reflex irritability did not increase with the metabolic rate, the anesthesia would likely be inadequate. But the reflex irritability DOES increase with the increased metabolism, which means in this hypothetical case, that, whereas the first dose of 88% gas was adequate in the first example, it will not be adequate in the second. A dose of 90% gas we might say is necessary here. Thus with the cell oxygen demand at 15% and the necessary dose of N2O at 90% we have a condition impossible to good anesthesia with N2O and Oxy. alone. If we must do the best we can under the circumstances, we shall carry our patient too lightly or shall carry them with a partial asphyxia, which latter means unquiet as much as the former. Take your choice.

Now in the normal subject, age considered only, as the metabolic factor we see that our most difficult possibilities are at the age of 5 to 7 and again about 12 to 14 years. We see also why the aged, - 60 to 80 years are easy to handle as a rule.

However there are any number of conditions elevating the metabolic rate, or depressing it. For example ANY ACUTE ILLNESS GIVING RISE TO HYPER PYREXIA is accompanied by ~~a proportionate~~ an increase in metabolism and reflex irritability, proportional to the degree of fever present. And that is only part of it. Any emotional excitement stimulates metabolism which factor must be considered in the management of not only induction, but the period of the first fifteen to twenty five minutes of anesthesia.

The more acute and violent any acute infection (Appendicitis, peritonitis, pneumonia, measles, scarlatina etc) may be the greater is the proportionate increase in metabolism and oxygen demand and reflex irritability, and the more difficult will be the anesthesia from the standpoint of quiet and relaxation.

Thus, you will see that, if we have brought into the hospital, a six year old boy with an acute appendicitis with peritoneal involvement, who is scared to death of the operating room, we have an almost impossible N2O case. The N2O must be aided by ether or local anesthesia, and often in these cases ether is necessary for a short time to quiet the patient sufficiently for the local anesthesia itself.

The exceptions to the above pathological increases in metabolism are cases in which the toxin of the disease seems

to depress rather than stimulate the patients and these exceptions, though few, are easy.

In reference to the so-called STIMULATED TYPES I am not so sure of the propriety of the above application, although for want of a better explanation, I have accepted it. Alcoholics, etc have a usual higher metabolic rate and higher reflex irritability, and that difficulty must be considered. Whether or not increased metabolism and reflex irritability constitute the entire difficulties in such cases I do not know,. I believe they will explain at least 75% of the trouble.

Thus in sizing up our patients, preparatory to anesthesia, we may group the conditions observed under the above classification, and be fore warned. Forewarned is fore armed and by applying the thought and classification properly, our results will be better.

Now as to Pre-anesthetic medication in connection with the above observations. Morphine is the greatest metabolic inhibitor that we have. Also it inhibits reflex irritability. Thus in morphine alone we have the answer from a purely physiological standpoint. But from the psychic standpoint it will not suffice. It does not as a rule depress the imagination or emotional excitability of the patient in proportion. Therefore we must give something with the morphine to care for the psychic or emotional sedation. Hyoscine or scopolamine head the list. Chloral or its allies, Chlorotone etc are valuable used in connection with the morphine and scopolamine. Of course we have been using these things empirically for years but I am convinced that the explanation of their value lies in the above.

Now Jay:- You have asked me a H-1 of a big question and I have answered in skeleton. I have presented this stuff once but believe that it did not go over strong; nor will it until it is published. However you can hand out all you care to at the meeting and among your friends. However I am saking that you do not show this paper to anybody except Bart. In other words, I am not yet ready to trust McGilvra with it. That may sound pretty plain, but I know that you will respect my wishes there.

Must cut this short to get it off. Mail it back to me after the meeting, as I am not making a copy.

Hope you have a good time and a good meeting.

Luck to you.

Guedel.

Am sending this uncorrected so overlook clerical errors.